

US009636007B2

(12) United States Patent

Hoberman et al.

(54) METHOD AND APPARATUS FOR AIDING IN THE DIAGNOSIS OF OTITIS MEDIA BY CLASSIFYING TYMPANIC MEMBRANE IMAGES

(71) Applicants: UNIVERSITY OF
PITTSBURGH—OF THE
COMMONWEALTH SYSTEM OF
HIGHER EDUCATION, Pittsburgh,
PA (US); CARNEGIE MELLON
UNIVERSITY, Pittsburgh, PA (US)

(72) Inventors: Alejandro Hoberman, Wexford, PA (US); Jelena Kovacevic, New York, NY (US); Nader Shaikh, Pittsburgh, PA (US); Anupama Kuruvilla,

Pittsburgh, PA (US)

(73) Assignees: Carnegie Mellon University,
Pittsburgh, PA (US); University of
Pittsburgh—Of the Commonwealth
System of Higher Education,
Pittsburgh, PA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35

U.S.C. 154(b) by 0 days.

(21) Appl. No.: 14/418,509

(22) PCT Filed: Jun. 11, 2013

(86) PCT No.: **PCT/US2013/045123**

§ 371 (c)(1),

(2) Date: **Jan. 30, 2015**

(87) PCT Pub. No.: WO2014/021994PCT Pub. Date: Feb. 6, 2014

(65) Prior Publication Data

US 2015/0305609 A1 Oct. 29, 2015

Related U.S. Application Data

(60) Provisional application No. 61/679,348, filed on Aug. 3, 2012.

(10) Patent No.: US 9,636,007 B2

(45) **Date of Patent:**

May 2, 2017

(51) **Int. Cl. G06F 19/00** (2011.01) **A61B 1/227** (2006.01)
(Continued)

(Continued)

(58) Field of Classification Search
NoneSee application file for complete search history.

(56) References Cited

U.S. PATENT DOCUMENTS

5,847,832 A * 12/1998 Liskow A61B 5/0064 356/605

2006/0282009 A1 12/2006 Oberg et al. (Continued)

FOREIGN PATENT DOCUMENTS

KR 10-2009-0128613 A 12/2009 WO WO2012061697 A1 5/2012

OTHER PUBLICATIONS

International Search Report, Korean Intellectual Property Office, Oct. 22, 2013.

Primary Examiner — Siamak Harandi Assistant Examiner — Mai Tran (74) Attorney, Agent, or Firm — Eckert Seamans Cherin & Mellott, LLC; Philip E. Levy

(57) ABSTRACT

A method of aiding the diagnosis of otitis media in a patient includes obtaining image data in a processor apparatus of a computing device, the image data being associated with at least one electronic image of a tympanic membrane of the patient, calculating a plurality of image features, each image feature being calculated based on at least a portion of the image data, classifying the at least one electronic image as (Continued)

